

LBA Program

The 2nd CEOP Annual Meeting
Geneva, Switzerland
15-17 September 2008

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Ministério da
Ciência e Tecnologia





Overview

- Background and Objectives
- Data Contributions/Requirements
- Recent Scientific Achievements
- Contributions to GEWEX Scientific Milestones (Roadmap)
- Accomplishments towards WCRP Goals
- Issues and Future Plans



The Large Scale
Biosphere-Atmosphere
Experiment
in Amazonia



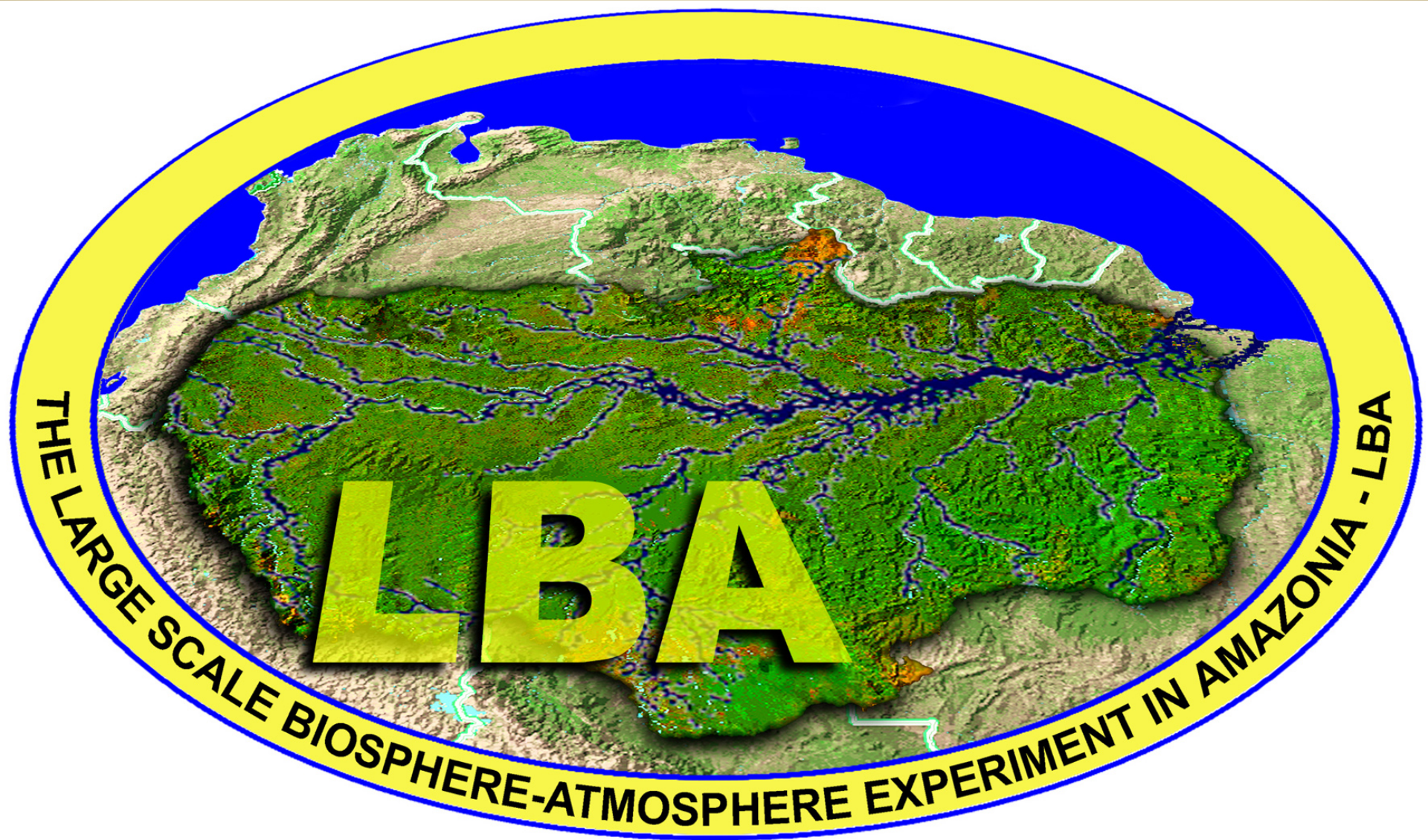
Background and Objectives

LBA

- **An international research initiative led by Brazil;**
- **Focuses on the climatological, ecological, biogeochemical, and hydrological functions of Amazonia; the impact of land use change on these functions; and the interactions between Amazonia and the Earth system;**
- **1000+ PIs, co-PIs, & researchers involved;**
- **100+ research projects;**
- **780+ metadata records & 500+Gbytes of data.**







THE LARGE SCALE BIOSPHERE-ATMOSPHERE EXPERIMENT IN AMAZONIA - LBA

The two overarching questions of LBA



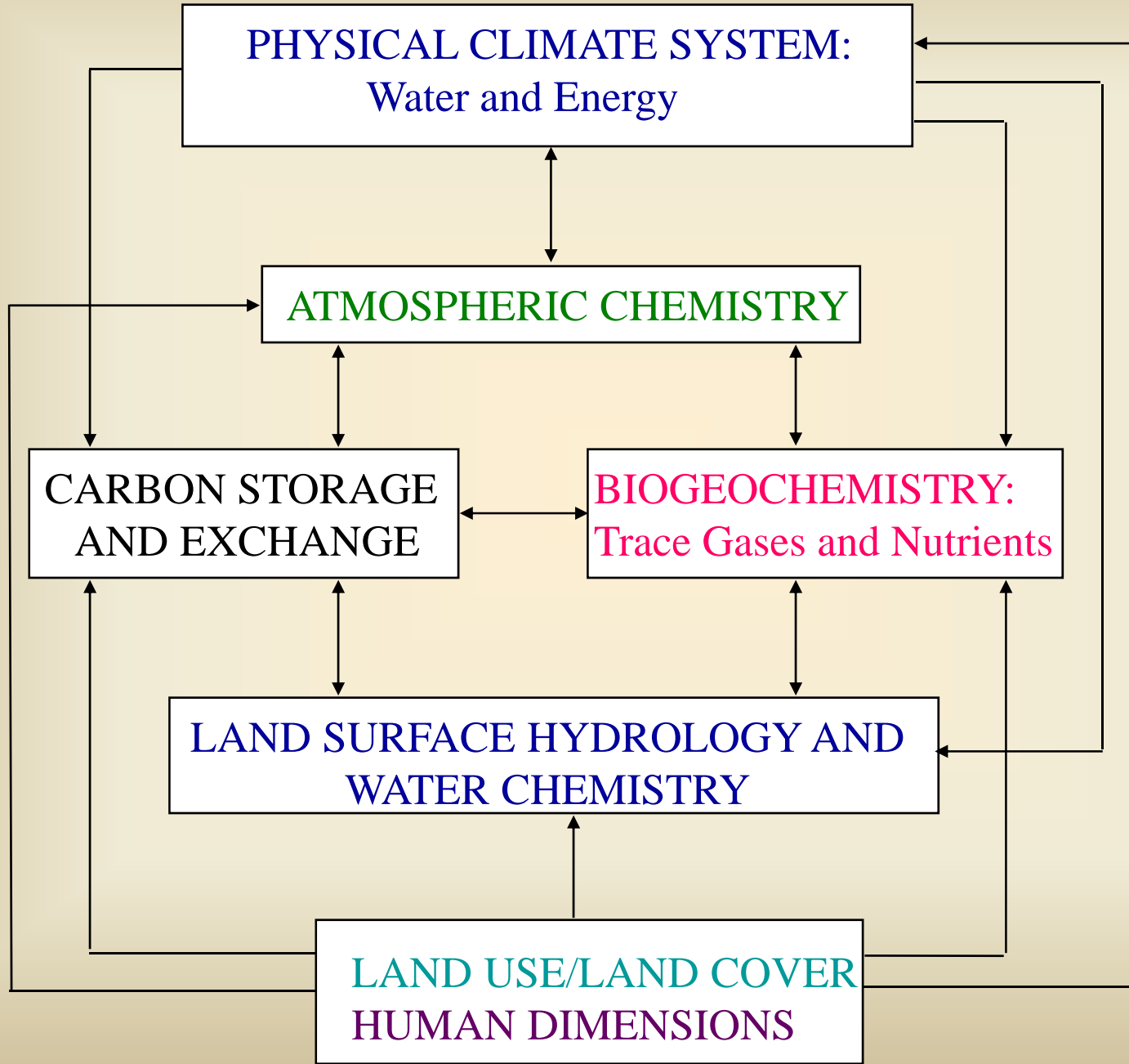
★ How Amazonia functions currently as a regional entity with respect to the natural cycles of water, energy, aerosols, carbon, nutrient and trace-gases?

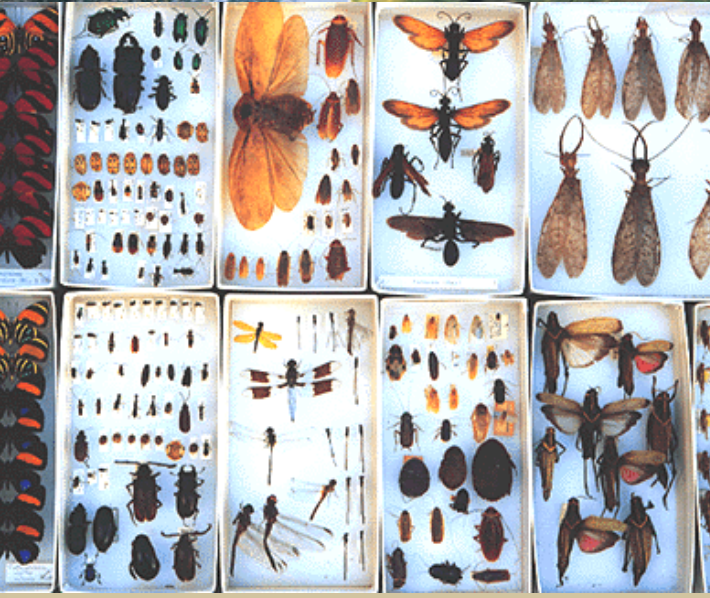
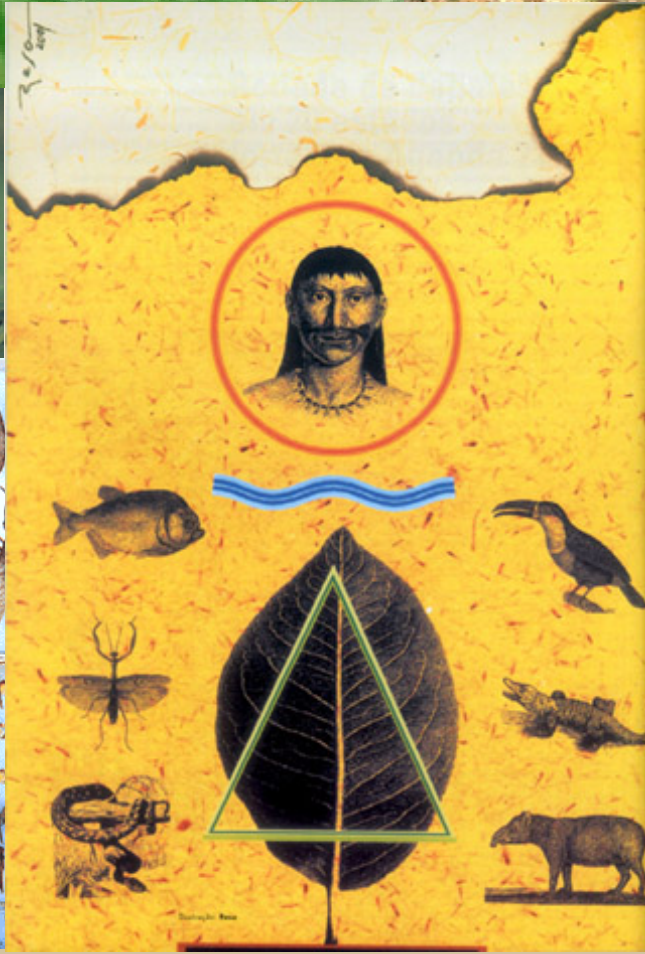
★ How will changes in land use and climate affect the biological, chemical and physical functioning of Amazonia, including its **sustainability** and influence on global climate?

Amazonia at a glance ... The Natural System

- **almost 6 million km² of contiguous tropical forests**
- **perhaps 1/3 of the planet's biodiversity**
- **abundant rainfall (2.2 m annually)**
- **18% of freshwater input into the global oceans (220,000 m³/s)**
- **over 100 G ton C stored in vegetation and soil**
- **a multitude of ecosystems, biological and ethnic diversity**

LBA LINKAGES





Biodiversity...



The forest...



The streams ...



The rains...

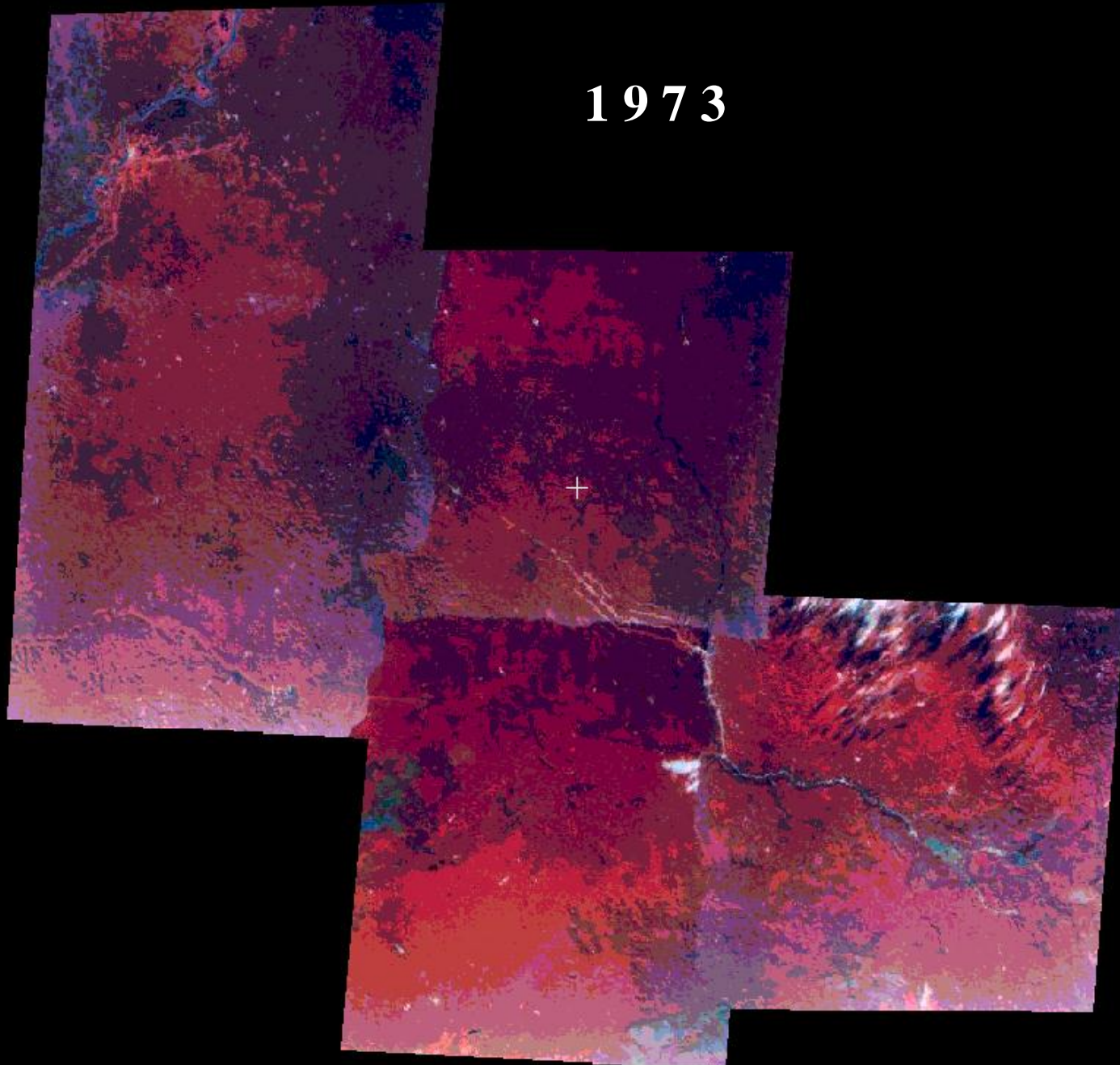
The rivers...





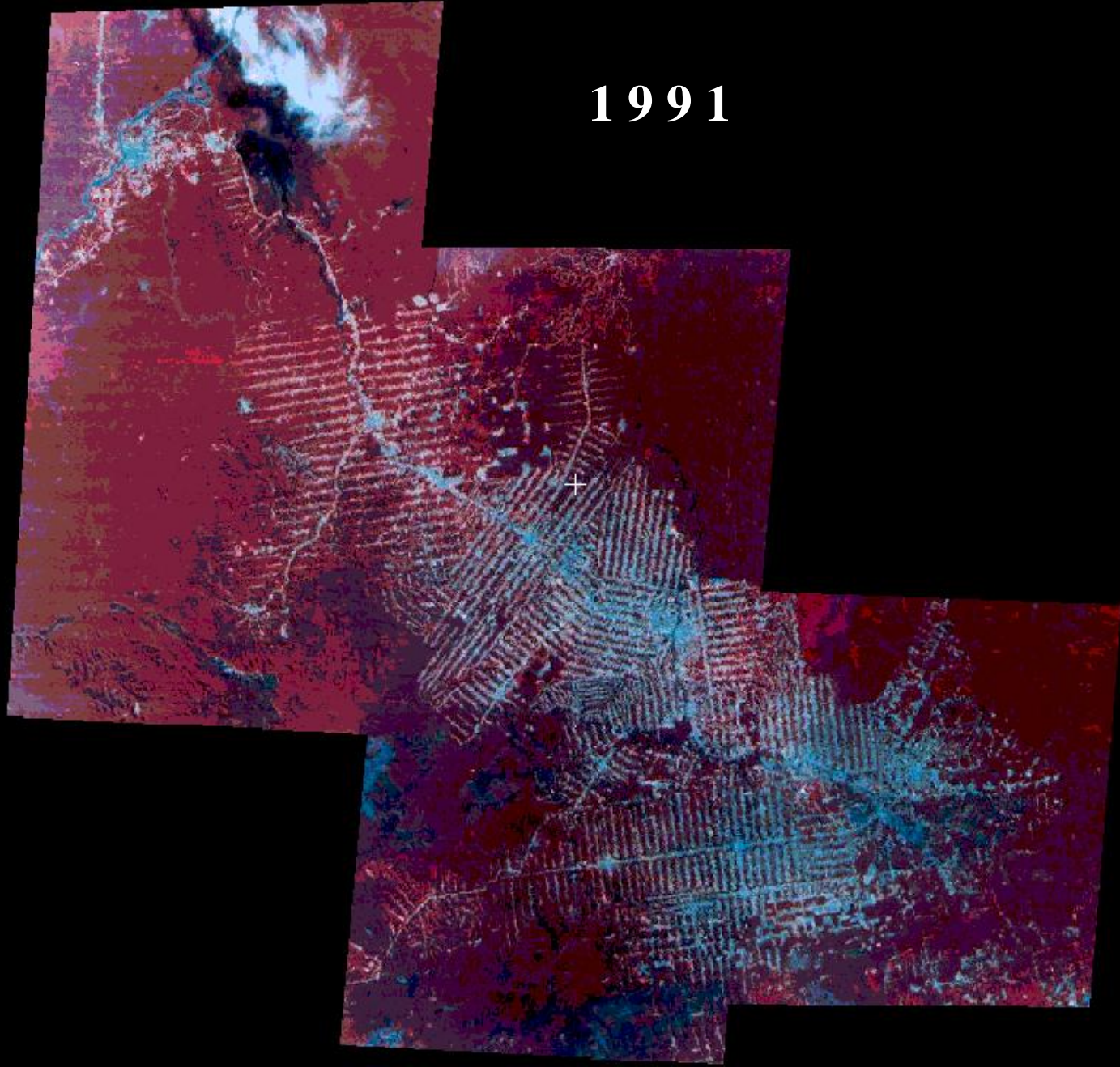
Deforestation...

Courtesy: INPE/OBT



1973

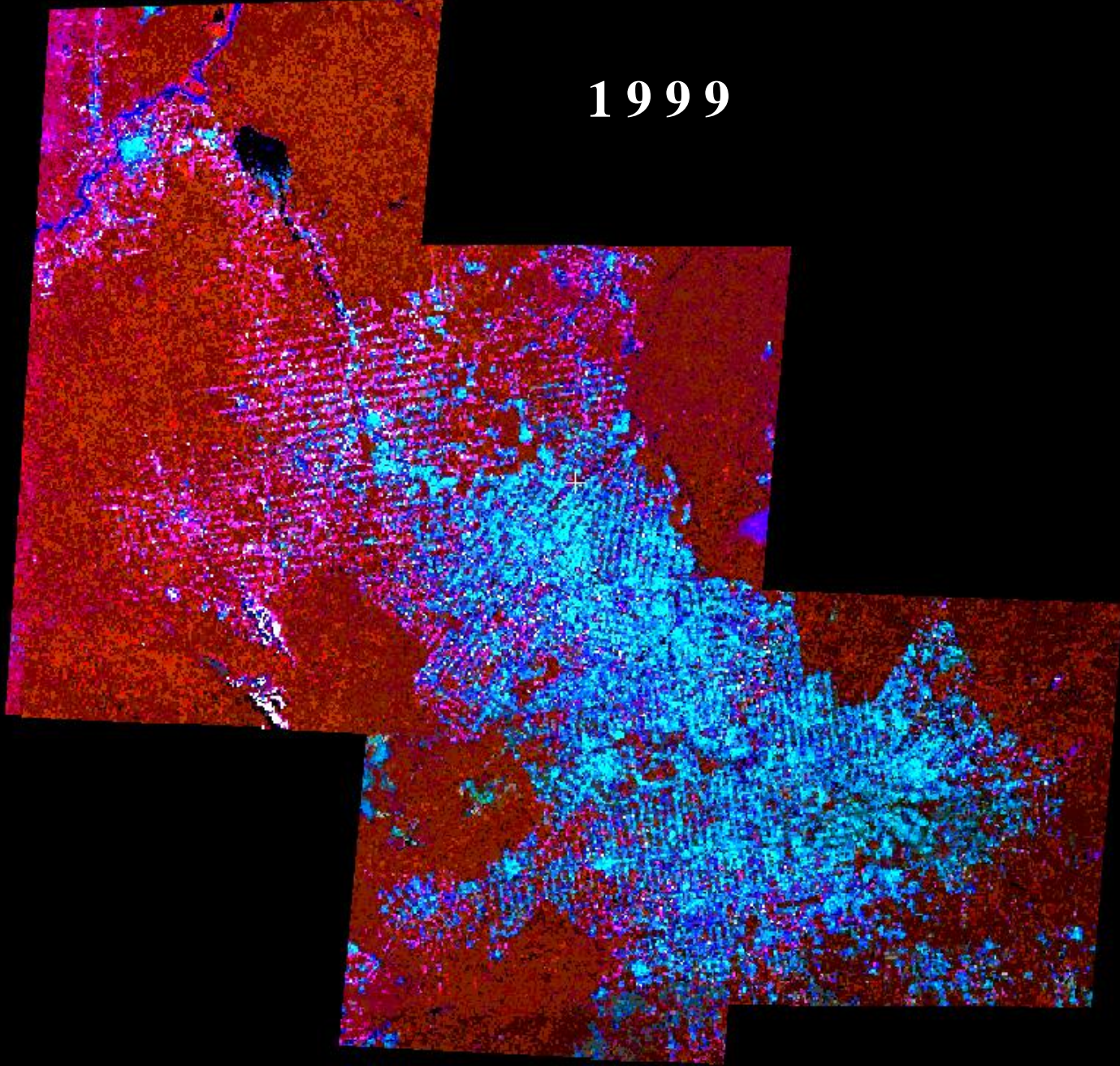
Courtesy: INPE/OBT



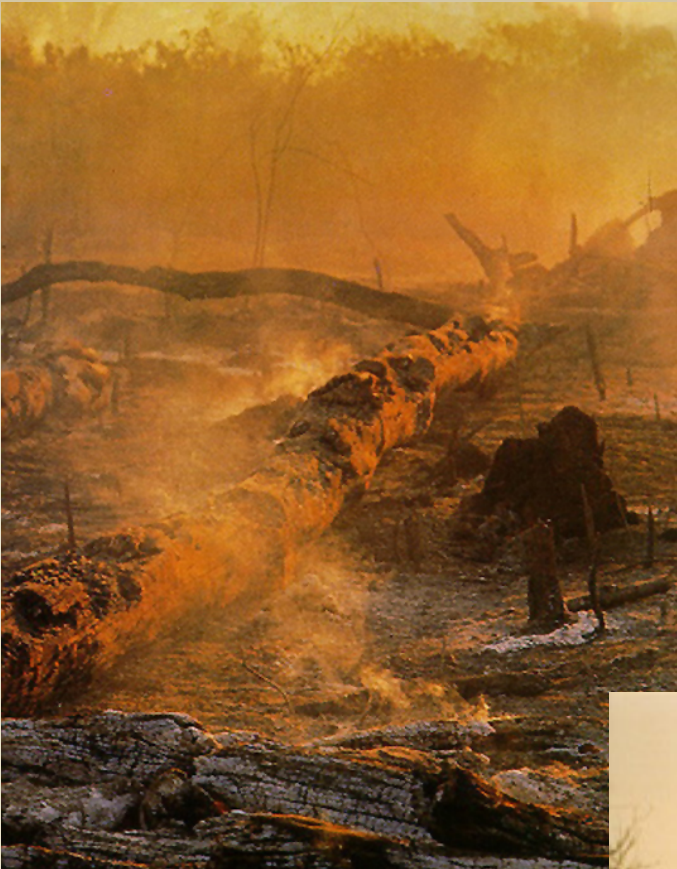
1991

Courtesy: INPE/OBT

1999



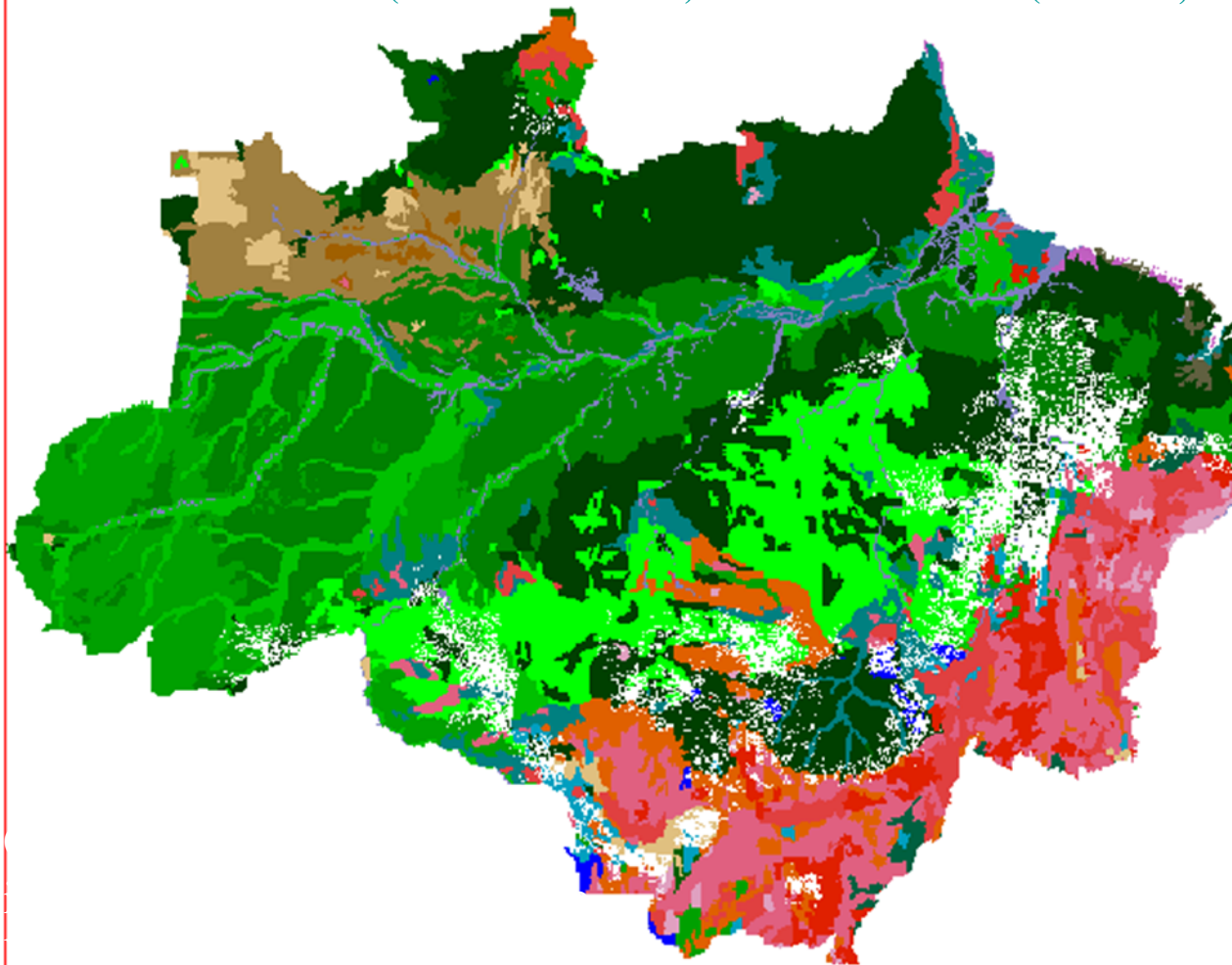
Fire...



Fire...



VEGETATION MAP (RADAM 1:5000000) + DEFORESTATION (PRODES, 1997)



Current patterns of deforestation in white color

Courtesy: R. Alvalá, E. Kalil, INPE

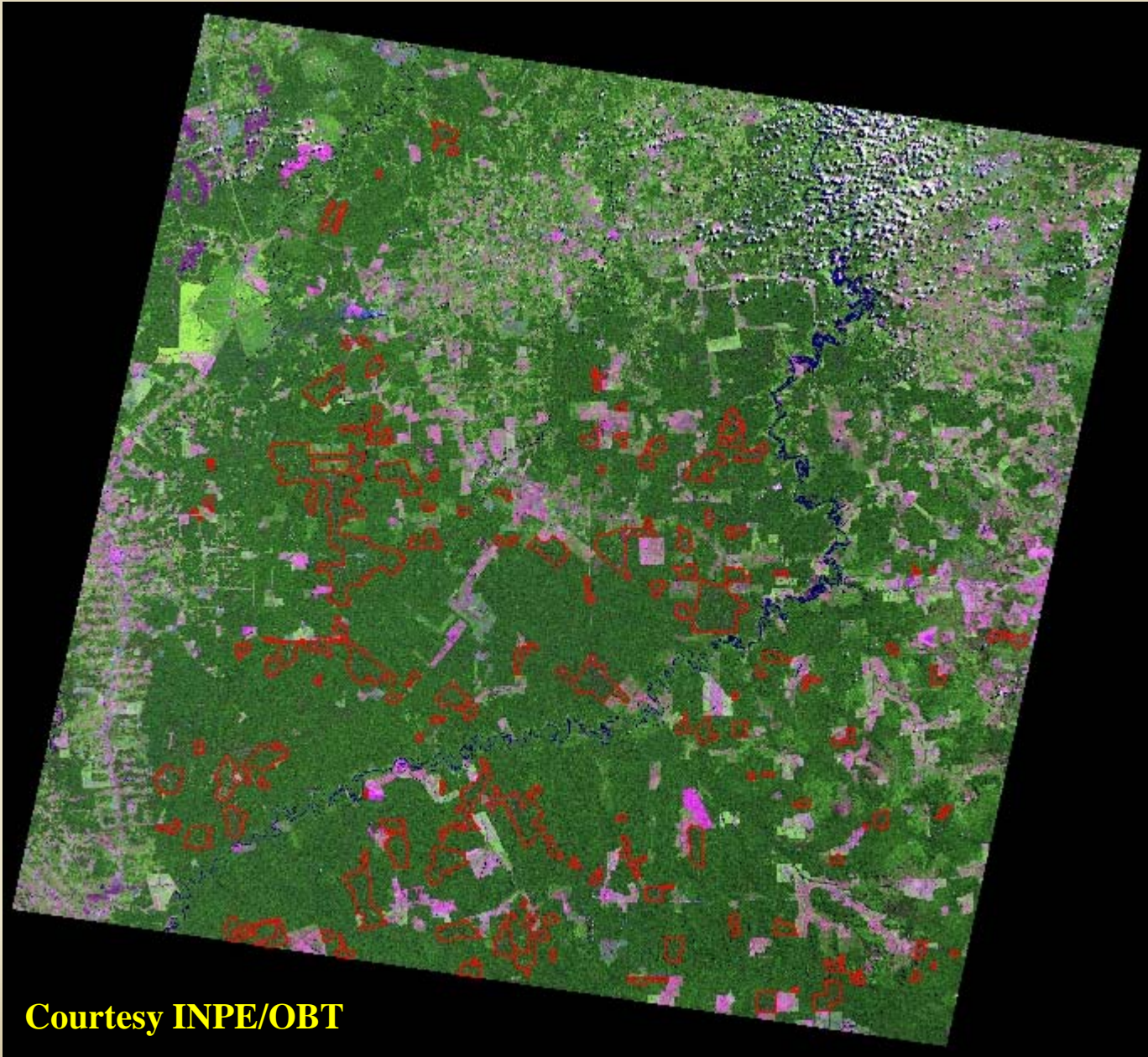
Selective logging...



SELECTIVE LOGGING



TOTAL AREA SELECTIVE LOGGING = 1,277 km²



Cena223/62

05/07/99

Courtesy INPE/OBT

Clear day

Visibility ~ ??? km

$N_{\text{CN}} \sim 500 \text{ cm}^{-3}$

$\text{BC} \sim 0.2 \mu\text{g m}^{-3}$



Smoke haze

Visibility ~ 800 m

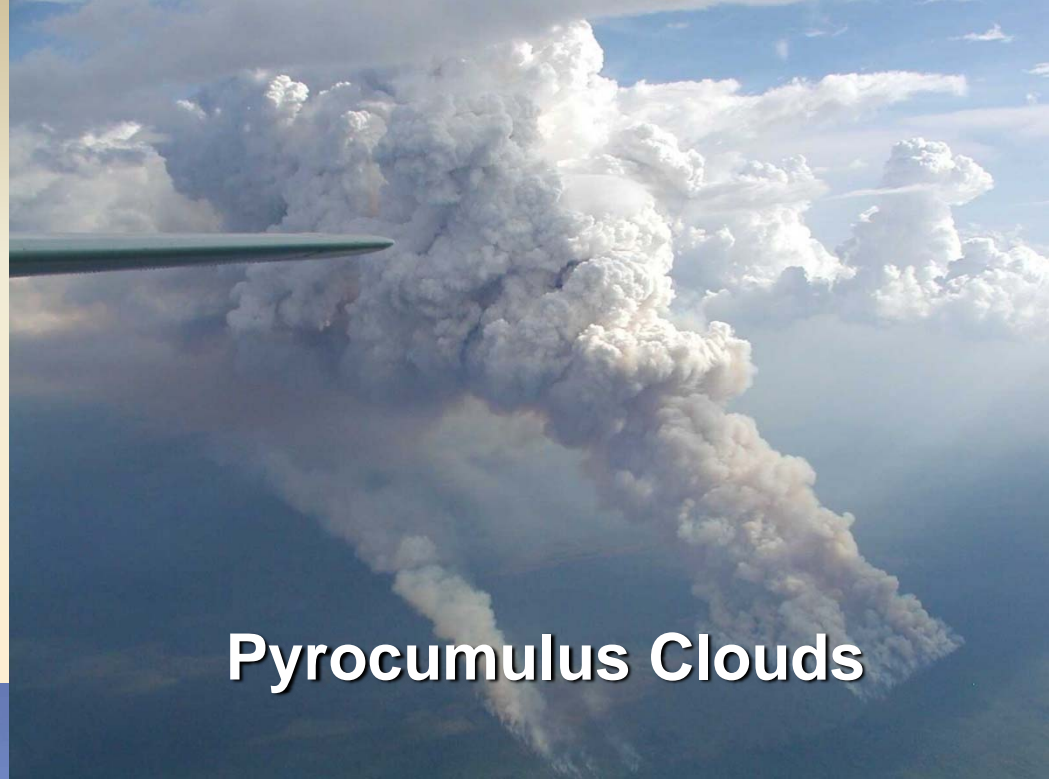
$N_{\text{CN}} \sim 10000 \text{ cm}^{-3}$

$\text{BC} \sim 7 \mu\text{g m}^{-3}$



Andrea et al

**Variety of cloud structure caused
by different CCN amounts and
other cloud dynamic issues**



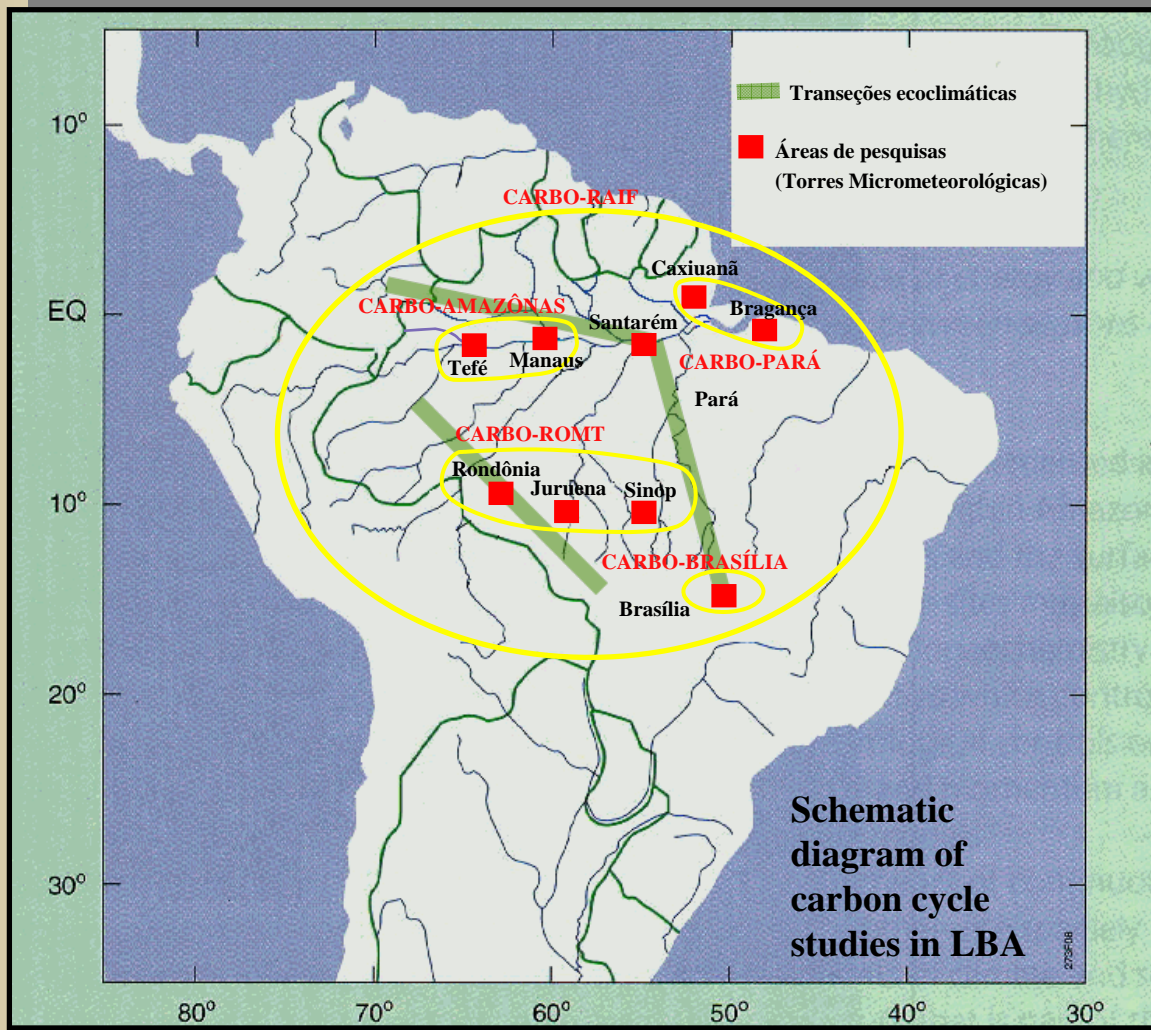
Pyrocumulus Clouds

“Green Ocean” Clouds





CARBON CYCLE STUDIES



LBA Objectives

- Combine analytical tools and innovative multidisciplinary experimental designs in a powerful synthesis to create new knowledge to address long-standing issues.
- Provide new understanding of environmental controls on flows of energy, water, carbon, nutrients, and trace gases between the atmosphere, hydrosphere, and biosphere of Amazonia to serve as a foundation for new policies for sustainable use of Amazonia natural resources.

Current LBA-DIS Node Configuration





The Large Scale
Biosphere-Atmosphere
Experiment
in Amazonia



Data Contributions

Simple Search **Advanced Search** Browse

Search by Keywords

FullText

**Hint: wildcards and phrases are allowed. Ex: %" or BIGFOOT;BOREAS*

[Help](#) | [Clear](#)

Search by Date Range

during thru

mm/dd/yyyy *mm/dd/yyyy*


[Help](#) | [Clear](#)

Search by Spatial-Coordinate

Select from the pick list below:

Select from list

Click on to make an area selection



Search Area:
overlaps encloses
North
West East
South

[Help](#) | [Clear](#)

Search from Data Sources

- LBA (Last Updated: Sep 04, 2008)
- ESIP (Last Updated: Sep 04, 2008)
- IAI (Last Updated: Sep 04, 2008)

**deselect the boxes to limit the search*

Query being built:

Not Editable

Results/Page: 10

Beija-flor:
LBA data search engine

Recent LBA Data announcements

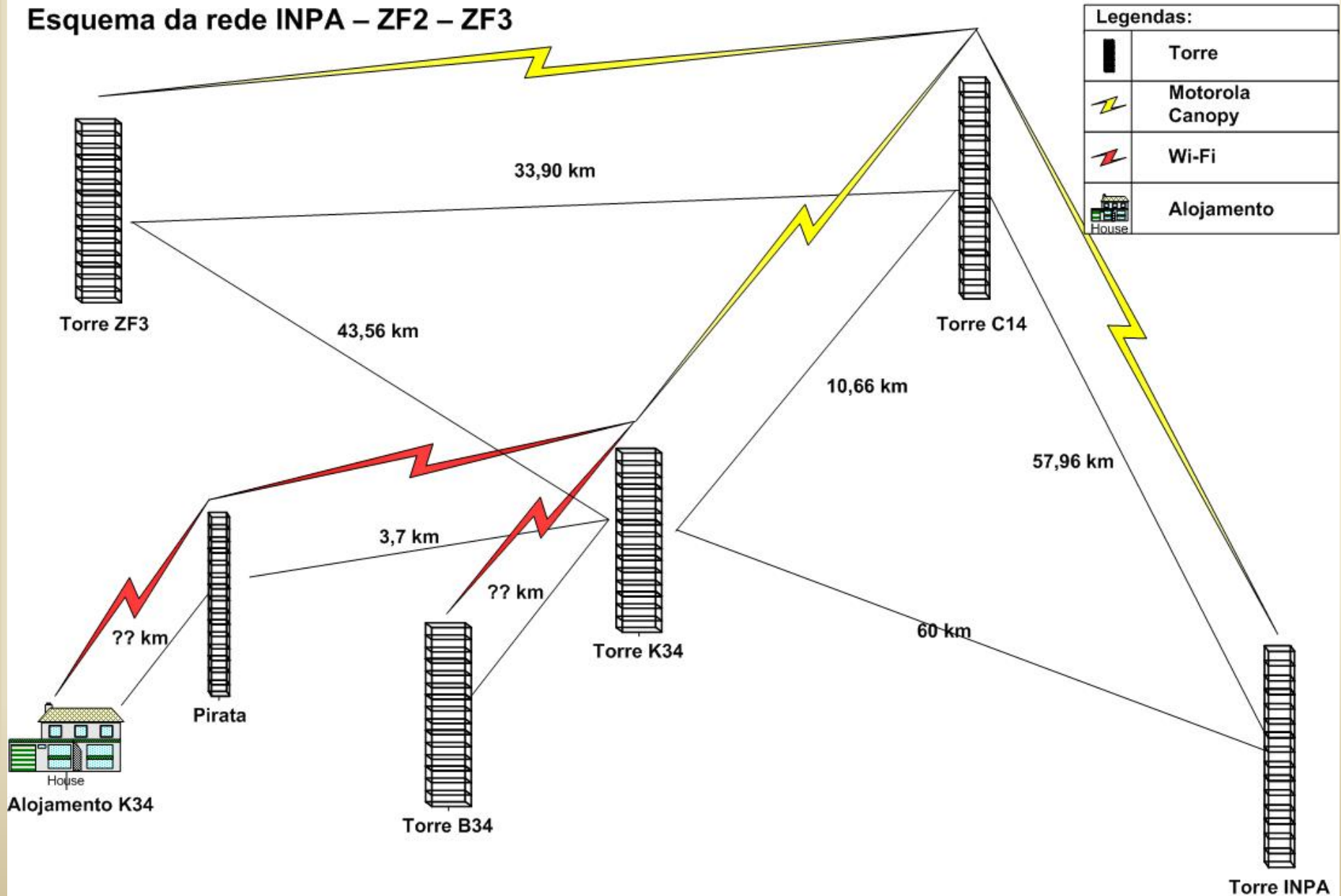
- Vegetation Fire Data: contains Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Level-1B satellite imagery over controlled burns in the State of Roraima in Northern Brazil , plus simultaneously collected soil and near-surface air temperature profiles.
- AVHRR Derived Fire Occurrence: contains an ArcGIS ArcInfo grid provides the number of hot spots detected across the legal Amazon Basin at 5 km resolution by the Advanced Very High Resolution Radiometer (AVHRR) sensor on NOAA 12, 14, 15, 16, 17, and 18 satellites

Recent LBA Data announcements (cont)

- Flux Tower Measurements
 - CO₂ PROFILES AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - TEMPERATURE PROFILES AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - CO CONCENTRATIONS AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - CO₂ AND H₂O EDDY FLUXES AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - H₂O PROFILES AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST.
- Vegetation Characterization Results
 - FOREST LITTER DATA FOR KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - FOREST GROUND-BASED BIOMETRY DATA AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - COARSE WOODY DEBRIS DATA AT KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST
 - TREE DBH MEASUREMENTS AT THE KM 67 TOWER SITE, TAPAJOS NATIONAL FOREST

Planned tower network topology

Esquema da rede INPA – ZF2 – ZF3



Motorola Digital Radios – Point to Point



Canopy Backhaul 20 Mbps



Point to Point Radio 30-60 Mbps

LBA Conference **INVITATION**



**International Scientific Conference
Amazon in Perspective
Integrated Science for a Sustainable Future
November 17–20, 2008
venue: Studio 5
Av Rodrigo Otávio 555, Japiim
Manaus, Amazonas, Brazil**

<http://www.lbaconferencia.org/>

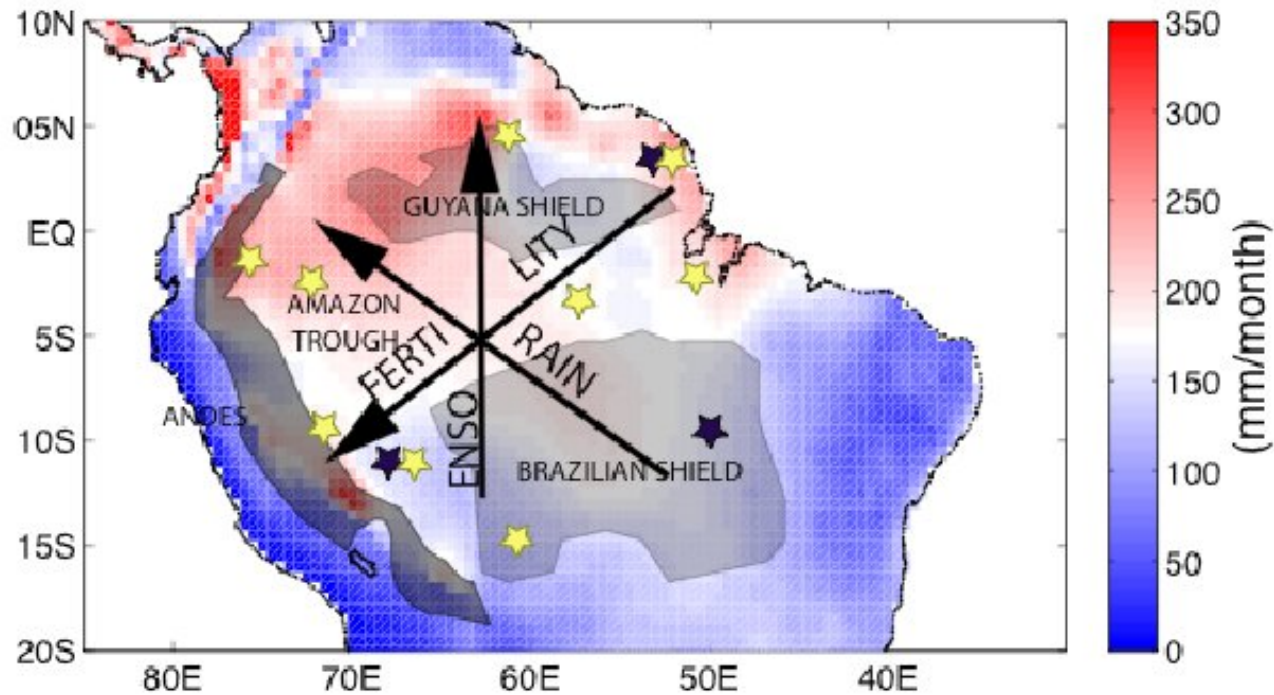
Estimated conference attendance : 950

Conclusions

- **New phase 3 of LBA just starting.**
- **Enhanced data CEOP validation routines being developed.**
- **LBA remains committed to CEOP.**

Recent Scientific Achievements

- LBA has provided the first comprehensive picture of

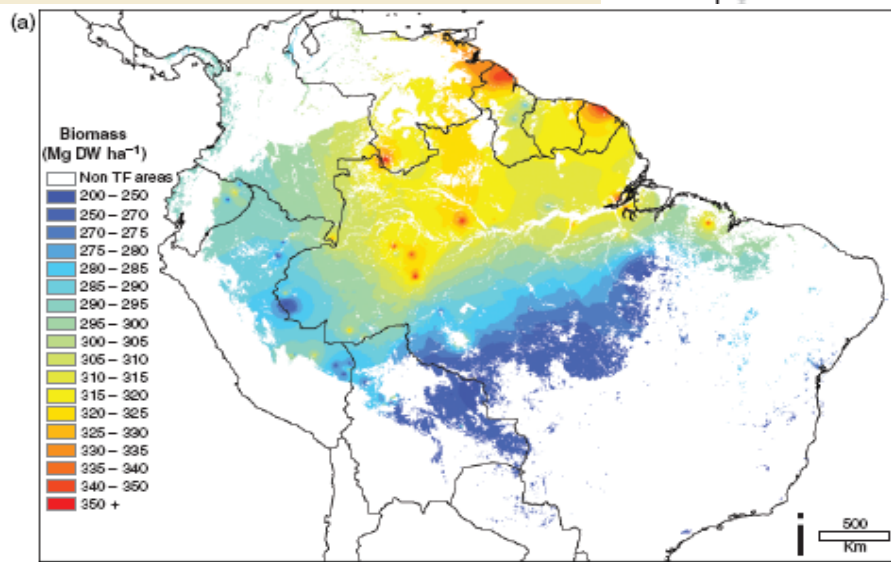


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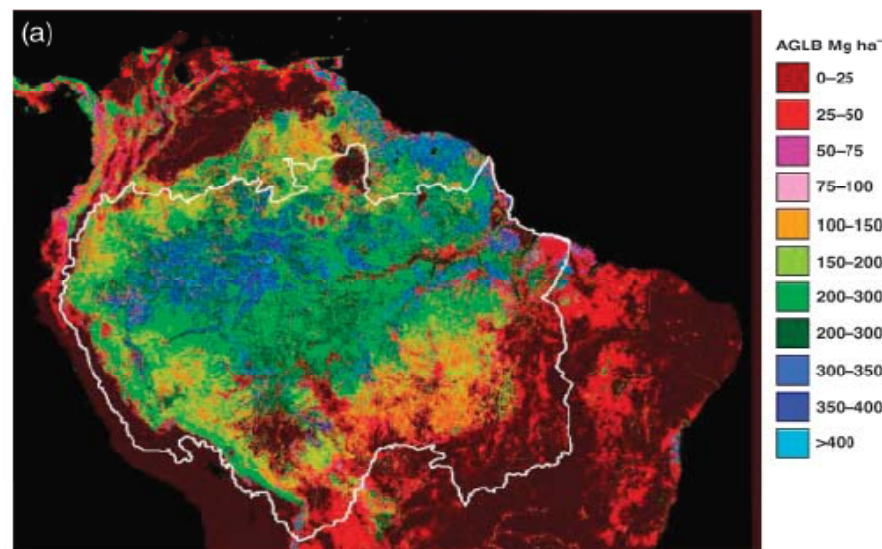
Source: Amazonica

Recent Scientific Achievements

- The basal area and dry season length are negative correlated (Malhi et al., 2006)
- In addition, the above ground live biomass is larger to the north than to the south (Malhi et al., 2006, Saatchi et al., 2007)

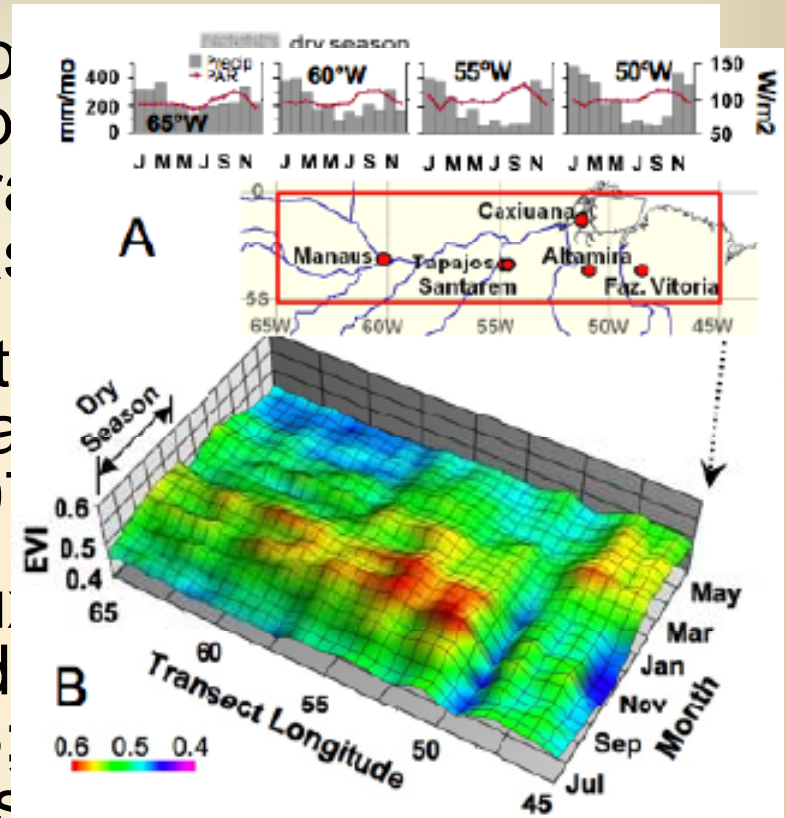
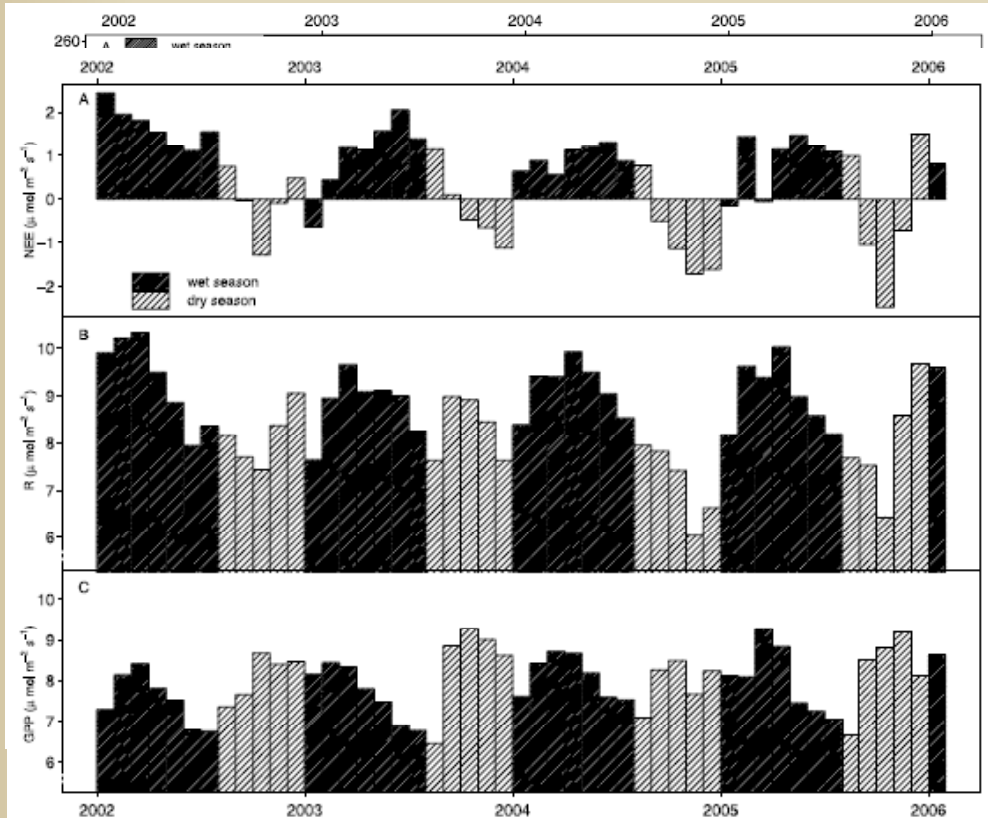


Malhi et al. (2006)



Saatchi et al. (2007)

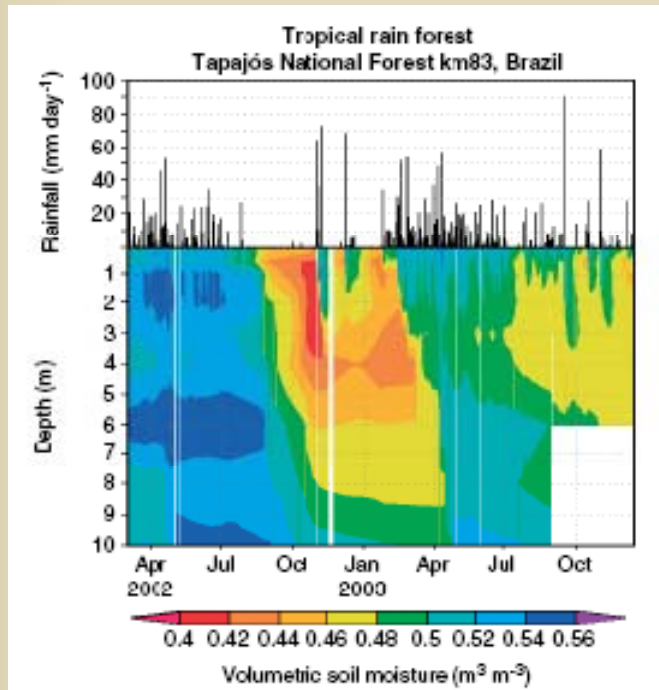
Recent Scientific Achievements



(Dickson & Henderson-Sellers, 1998; Werth & Hutrya et al. (2007); Avissar, 2004; Lee et al., 2005) Huete et al. (2006)

Recent Scientific Achievements

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Bruno et al. (2006)

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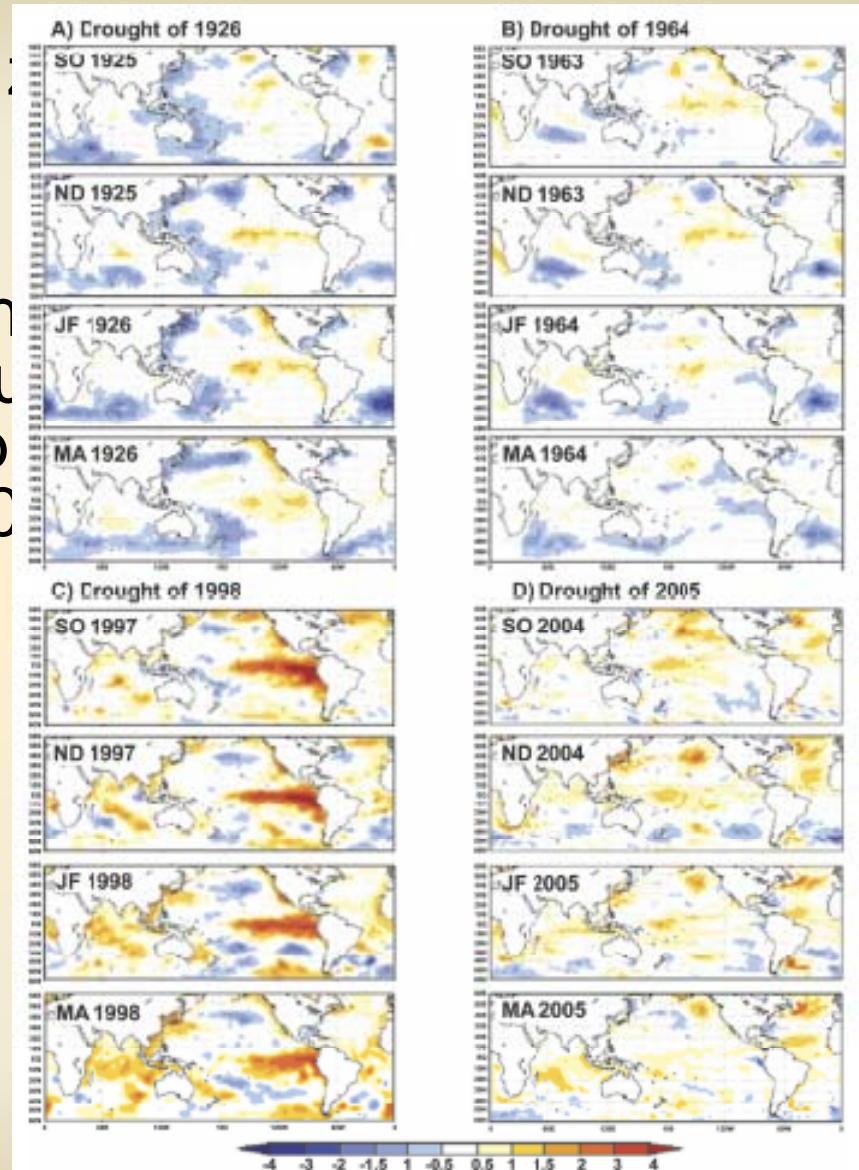


FIG. 1. (a)–(d) SST anomalies (°C) during SO, ND, JF, and MA during some years with drought conditions in Amazonia (1925–26, 1963–64, 1997–98, and 2004–05). SST anomalies are in relation to the 1961–90 baseline period. Color scale is shown at the bottom of the figure.

Contributions to GEWEX and WCRP goals

- Global Climate Models decreases in Amazon in phase with precipitation
- Hasler & Avissar (2006) in ET for station Manaus (ET increasing during dry season (September) and decreasing during wet season (December–March) in phase with the net radiation
- In stations located in the Amazon clear seasonality in net radiation or ET. In Manaus net radiation and ET are in phase during the wet season, but out of phase during the dry season, which is likely a result of regional climate

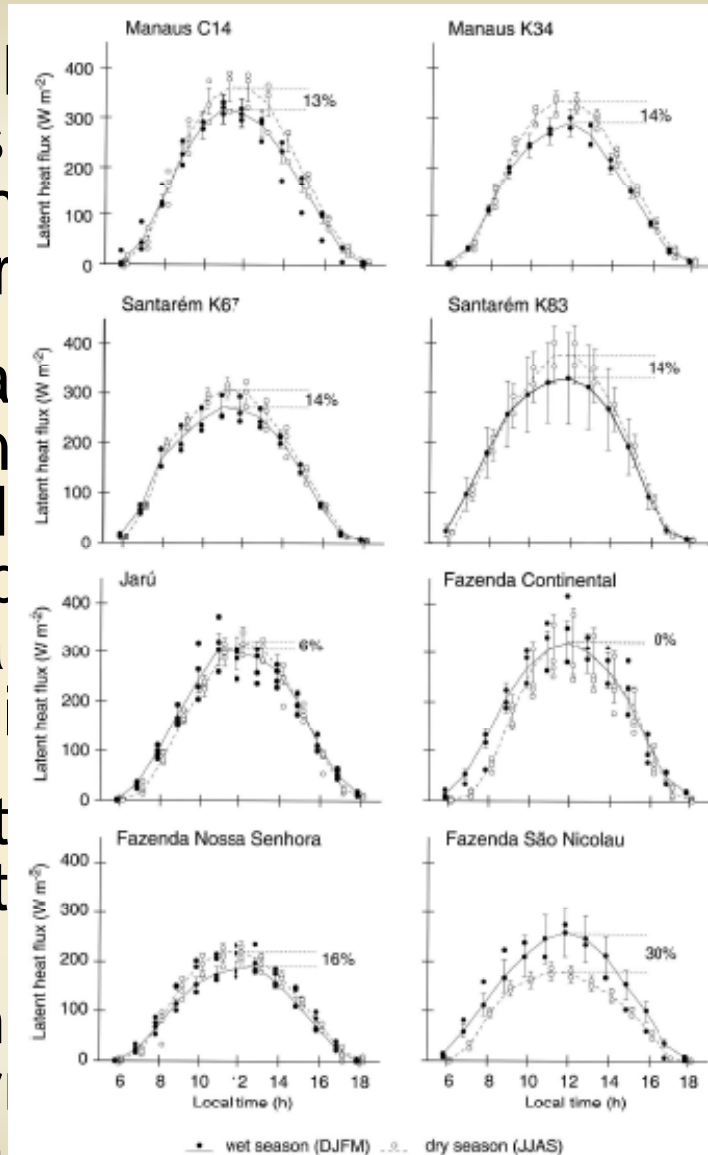
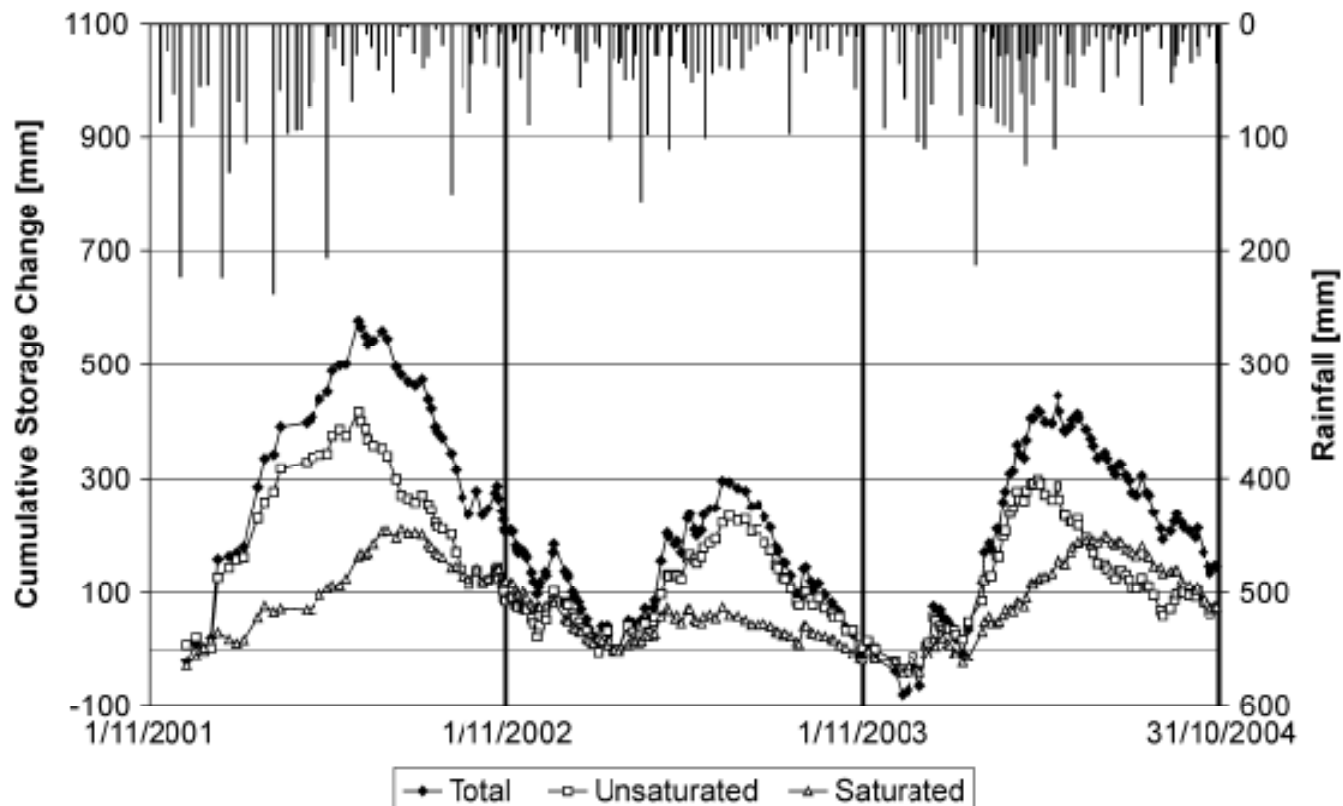


FIG. 3. Diurnal patterns in latent heat flux λE ($W m^{-2}$) averaged over the wet season (solid line) and the dry season (dashed line) for the entire period. Error bars represent standard error on mean. Closed (wet season) and open (dry season) circles are the average per year. Note that the wet and dry season data are slightly shifted for better visibility.

gional climate
 out of phase during
 dry season, with
 seasonality of
 $\sim 3^\circ S$), with
 ET increasing during
 the wet season
 and decreasing during
 the dry season,
 which is likely a
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 climate

Contributions to GEWEX and WCRP goals

- GCMs and RCMs indeed tend to overestimate dry



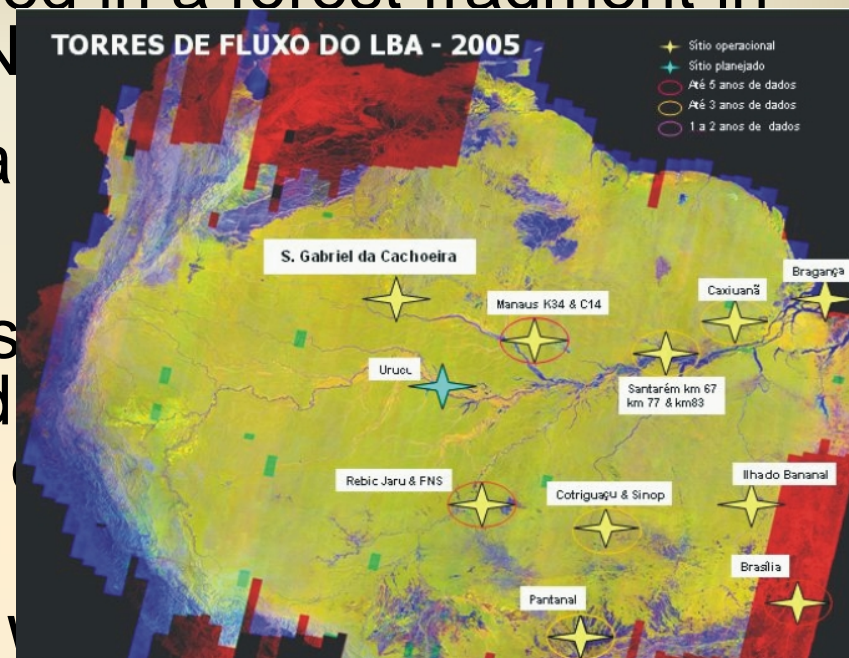
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water balance in atmospheric models for the Amazon basin, specifically when groundwater system is usually not taken into account explicitly

Tomasevic et al. (2007)

Issues and Future Plans

- New flux-tower was installed in a forest fragment in



in the wetlands

- Recovering of degraded/abandoned areas (either via agroforestry systems or afforestation or reforestation)

The End !

Thanks for your time.